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Soil Survey

of

Pittsburg County, Oklahoma

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Bureau of Chemistry and Soils

In cooperation with the
Oklahoma Agricultural Experiment Station

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SOIL SURVEY OF PITTSBURG COUNTY, OKLAHOMA

By M. H. LAYTON, United States Department of Agriculture, in Charge, and M. E. CARR and C. B. BOATRIGHT, Oklahoma Agricultural Experiment Station

COUNTY SURVEYED

Pittsburg County is in the southeastern part of Oklahoma (fig. 1). McAlester, the county seat, is approximately 125 miles southeast of Oklahoma City. Canadian River forms the northern boundary. The total area of the county is 1,370 square miles, or 876,800 acres.

Physiographically most of the county is rather rugged and hilly. It comprises stony ridges with smoothly rolling or undulating valleys intervening. Post oak and blackjack oak grow on the sandstone ridges which have an approximate northeast-southwest trend. The southern part of the county is extremely rough and hilly. It includes the Limestone Ridge, Pine Mountain, and Jackfork Mountain terrains. Other rough areas are in the northwestern and northeastern parts. Those in the northeastern part include the Brooken Mountain and Panther Mountain terrains. These and the hilly areas of the southeastern part may be considered a part of the Ouachita Mountain province. In the rough hilly sections of the northern part many hills extend to the banks of the river, above which they rise to heights ranging from 50 to 150 feet. The valleys in these sections are very small, and most of them are V-shaped. They have been formed by the action of small streams seeking an outlet to Canadian River.

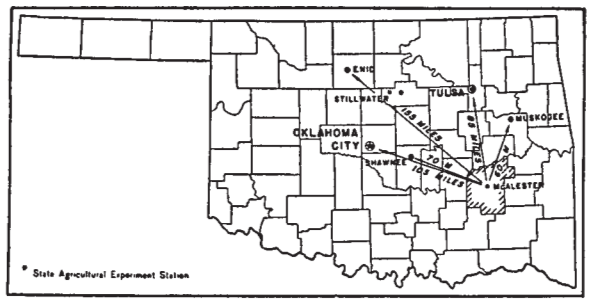

FIGURE 1.—Sketch map showing location of Pittsburg County, Okla.

Most of the larger valleys, which are gently rolling or almost level, are in the north-central and south-central parts of the county. Large areas of practically level lowland country are in the vicinity of Pittsburg, south of Indianola, northwest of Crowder, west of Ashland, and north of Kiowa, and one such area extends from Quinton to Reams. The greater proportion of these areas is prairie, but where the upland forested areas occur, the land in general is rocky and the relief hilly. The slopes are rather gradual, except in and near the more rocky ridges. The valleys have been dissected slightly and are a product of erosion and denudation. The adjacent uplands rise from a few feet to more than 200 feet above the prairie lands.

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The average altitude of Pittsburg County is about 700 feet. The lowest elevation is in the northeastern part and the highest in the southeastern part. According to United States Geological Survey benchmarks, the elevations of a number of towns in the southern half of the county are as follows: Hartshorne 668, Blanco 797, Savanna 795, Ti 888, Kiowa 773, and Weathers 1,017 feet. The towns in the northern half have elevations as follows: McAlester 750, Canadian 717, Indianola 652, and Quinton 616 feet.

The county as a whole has a good drainage system. Canadian River receives about four-fifths of the drainage through Gaines, Scipio, and Longtown Creeks and other minor streams which flow northward into the river, most of them originating within the county. On the southwestern side of the divide a few minor streams, such as Birch, North Boggy, and Buck Creeks, flow southward and eventually reach Red River. On the southeastern side of the divide, drainage is effected through Jackfork and North Jackfork Creeks, which flow in a northeast direction out of the county, finally reaching Arkansas River. Most of the streams flowing directly into Canadian River are swift in the more rugged areas, but as they reach the broader valleys they become more sluggish and deposit considerable alluvial material.

The native vegetation of the prairies consists largely of grasses of the *Andropogon* and *Aristida* species, commonly known as broomsedge and poverty grass, respectively, and some other tall grasses. These are also the most abundant grasses on the overgrazed land, and on the long-overgrazed pastures many different weeds have encroached. On the poorly drained areas sedges and sloughgrasses predominate. On the rough, rugged, and stony areas the native vegetation is mainly a small-tree growth of post oak, blackjack oak, elm, cedar, hickory, black oak, walnut, blackhaw, and in some places pines. On the stream bottom lands, elm, water oak, red oak, sycamore, sweetgum, locust, birch, willow, pin oak, redbud, pecan, and ash trees are numerous. Buckbrush, blackberries, briers, and wild grapevines are common on the lower slopes. On slopes from which the surface soil has been eroded to a great extent, vegetation is sparse, whereas on the uneroded soil it is abundant. The greater part of the merchantable timber has been removed, and, owing to frequent fires, the second growth as well as the original vegetation has been partly destroyed.

The land included in Pittsburg County was originally a part of Indian Territory and was inhabited by the Choctaw Indians. The county was organized from part of the Choctaw Nation in 1907, when Oklahoma became a State. In 1820, the Choctaw Indians exchanged land lying east of the Mississippi for land west of that river. This is now Oklahoma. McAlester, the county seat, was the capital of the Choctaw Nation, and by 1880 it had a population of 500. The population of the county increased steadily after the first railroad was built (in 1871), and in 1930 it numbered 50,778 people, of whom the census lists 82.3 percent native white, 2.6 percent foreign-born white, and 7.4 percent Negro. The rest are mainly Indians. McAlester is the largest city and chief business center. According to the 1930 census it has a population of 11,804.

There were 3,094 Indians in this county in 1930. Many Indians, because they have been unaccustomed to the confinement of farming

and because many of them were allotted poor land, became discouraged and have not aided much in the development of agriculture. On the other hand, some of the leading farmers are Indians.

The early settlers in this section of the country came principally from the older Southern States. The central and north-central parts of the county are well occupied by farms, but, in the northeastern, northwestern, and southern parts, or the rougher sections, large areas are rather sparsely settled. Nearly 70 percent of the population is classed as rural and averages 25.8 persons a square mile. A large proportion of the population consists of coal miners, many of whom are foreign born. The coal industry utilizes a large nonagricultural population and is responsible for the building and development of a number of small towns and camps. This industry has an indirect stimulating effect on agriculture, as it furnishes a large market for farm products.

The chief industries, other than agriculture, are the production of coal and gas. The largest artificial lake in the State is located near McAlester. It is the source of water supply for McAlester and brings that city considerable revenue through fishing permits. There is a lead smelter and also one of the largest gas fields in the State at Quinton, and a large gas field is east of Blocker. Several coal mines are in operation within a short distance of McAlester. The next largest town to McAlester is Hartshorne, which has a population of 3,587. It is an important commercial point, owing to its proximity to large coal fields. Other towns of local importance are Quinton, Crowder, Indianola, Canadian, Savanna, Kiowa, Krebs, Alderson, and Haileyville. A number of small towns and villages are distributed throughout the county and are interior trading points of slight importance. Many of them have cotton gins.

Three railroads serve Pittsburg County, the Missouri, Kansas & Texas; the Chicago, Rock Island & Pacific; and the Fort Smith & Western, in addition to the Pittsburg County Railway (an electric line) which connects the towns around McAlester and Hartshorne. Toward the outer boundaries of the county are a number of farms that are about 20 miles from a shipping point. There are two hard-surfaced highways, one extending in a north-south direction, the other in an east-west direction, intersecting in McAlester. The Federal-aid and State roads are kept in good condition, but the county and township roads have received little attention until recently, when much interest has been taken in the construction of good roads. All except the hard-surfaced roads become almost impassable and are difficult to travel during long-continued wet seasons, and even some of the main roads become almost impassable during severe winters.

Rural mail delivery and telephone service reach most sections. There are many schoolhouses and churches located at convenient intervals. McAlester has a junior college and an excellent library. The State penitentiary is located in this city.

Local markets absorb most of the farm products, except beef cattle, hogs, poultry, and cotton. The towns and the coal centers are good markets for small quantities of poultry, fruit, and dairy products. Cattle, hogs, and poultry are shipped mainly to Kansas City and Fort Worth. A few sawmills, which utilize the oak and pine for lumber, are scattered throughout the county. Much of the best timber has been cut.

CLIMATE

The climate of Pittsburg County is continental and is characterized by wide seasonal variations. It has a good combination of sunshine and rainfall. About 60 percent of the average annual precipitation of 42.70 inches falls during the growing season, from April to September, inclusive. The rains are generally in the form of showers of short duration. The winters are mild, and blizzards are rare. Probably not more than two or three snows fall during any one winter, and these are usually light and soon melt. The spring and fall seasons are cool and windy, and the summers are hot and generally dry. High northerly winds often precede and accompany cool waves, but the most damaging winds are the hot winds which commonly occur during prolonged dry periods. These winds are from the southwest and are generally strong. Droughts are due more to the high evaporation and the large proportion of sunshine than to lack of rain. Late spring frosts do much damage to fruits and vegetables, especially peaches. The average date of the last killing frost is March 23 and of the first is November 9. This gives an average frost-free season of 231 days. The latest recorded killing frost was on April 22, and the earliest was October 9. The mean annual temperature is 62.4° F.

Table 1, compiled from records of the United States Weather Bureau station at McAlester, gives the normal monthly, seasonal, and annual temperature and precipitation.

TABLE 1.—*Normal monthly, seasonal, and annual temperature and precipitation at McAlester, Pittsburg County, Okla.*

[Elevation, 698 feet]

Month	Temperature			Precipitation			
	Mean	Absolute maximum	Absolute minimum	Mean	Total amount for the driest year (1896)	Total amount for the wettest year (1908)	Snow, average depth
	°F.	°F.	°F.	*Inches*	*Inches*	*Inches*	*Inches*
December	42.6	79	3	2.61	0.50	0.28	1.8
January	40.6	84	−7	2.66	1.15	2.60	2.1
February	44.6	90	−7	2.12	2.00	3.96	2.5
Winter	42.6	90	−7	7.39	3.65	6.84	6.4
March	54.0	96	12	3.15	1.50	2.57	.2
April	62.1	92	23	4.61	1.50	10.17	(1)
May	69.4	95	34	6.14	7.00	11.20	.0
Spring	61.8	96	12	13.90	10.00	23.94	.2
June	78.2	106	47	4.47	2.25	11.76	.0
July	82.3	109	53	3.23	1.50	1.21	.0
August	82.2	110	50	3.56	2.75	3.25	.0
Summer	80.9	110	47	11.26	6.50	16.22	.0
September	76.0	107	37	3.41	2.00	4.69	.0
October	64.3	98	18	4.02	2.65	8.85	(1)
November	53.0	87	11	2.72	2.05	7.00	.1
Fall	64.4	107	11	10.15	6.70	20.54	.1
Year	62.4	110	−7	42.70	26.85	67.54	6.7

[1] Trace.

AGRICULTURE

The first industries of the area now included within the limits of Pittsburg County were cattle raising and general farming. Farming first was carried on in a small way to produce food crops, mainly for home use. With the discovery of coal, about 1876, agriculture became second in importance among the local industries. Agriculture consisted mainly of general farming, with corn, potatoes, and hay as the leading crops. As a part of the country was forested, the fields were prepared by deadening the standing timber, after which crops were grown on the partly cleared land. Subsequently, the timber was removed and the land made wholly available for cultivation. This practice is still followed in clearing new land.

According to the census of 1935, the average size of the 4,291 farms was 114 acres in that year. The average acre value of land (including buildings) was $12.39. The proportion of the county in farms was 55.8 percent. The number of tenant-operated farms has increased within recent years. In 1935, tenants operated 68.2 percent of the farms, owners and part owners 31.4 percent, and managers 0.4 percent. Nearly 24 percent of the land is classed by the census as available for crops.

The greater part of the commercial fertilizers purchased are used by only a few farmers, mainly in connection with truck farming. According to local reports five carloads of fertilizers were used in 1929, mostly 2–12–2 and 4–12–4 mixtures.[1] Experiments on the State farm at the penitentiary showed the best results from fertilizers high in phosphate.

Many of the farm buildings are poorly constructed. They include box-type houses, pole and sheet-iron open barns, and a few machine sheds. A few farms, however, are well improved.

There were 43,693 head of cattle on the farms on January 1, 1935. Dairying is an important industry in the vicinity of McAlester. The chief dairy breeds are Jersey and Holstein-Friesian. Most of the cattle are grade animals, and a few purebred herds are maintained. Horses average about two or three to a farm, and a few mules are used. The 1935 census lists a total of 6,071 horses and 5,256 mules on January 1 of that year. The raising of poultry is carried on extensively, and the sale of poultry and poultry products is an important source of revenue on nearly every farm. The average flock consists of about 75 chickens. Most of the flocks are mixed, but a number, composed of purebred chickens, were noticed at the time this survey was made. Rhode Island Red, Barred Plymouth Rock, White Plymouth Rock, White Leghorn, Brown Leghorn, and Minorca are the chief breeds, and considerable culling is done, with good results. Some eggs and poultry are shipped to Kansas City. The principal breeds of hogs are Poland China and Duroc-Jersey, and some Hampshire are raised. The average number of hogs kept on the farms is about five. Very few hogs are shipped from the county, and most of them are consumed on the farm where raised. The census enumerates 18,798 swine on the farms in 1935. Sheep and goats are of minor importance.

[1] Percentages, respectively, of nitrogen, phosphoric acid, and potash.

Table 2 shows the acreage devoted to the leading crops in 1909, 1919, 1929, and 1934.

TABLE 2.—*Acreage of the principal crops in Pittsburg County, Okla., in stated years*

Crop	1909	1919	1929	1934	Crop	1909	1919	1929	1934
	Acres	*Acres*	*Acres*	*Acres*		*Acres*	*Acres*	*Acres*	*Acres*
Cotton	23,557	59,345	45,290	40,976	Potatoes	410	562	766	1,024
Corn	44,218	52,799	63,311	53,230	Sweetpotatoes	166	519	422	569
Oats	1,535	31,189	12,513	16,349	Hay and forage	12,778	23,693	10,995	33,760
Wheat	66	4,410	12	240	Grain sorghums	7	236	1,269	3,531
Peanuts	10	605	649	(1)					

[1] Not reported.

SOILS AND CROPS

Pittsburg County is within the Ouachita Mountain province. It lies at the western extension of that section, in which the mountain-like hills and ridges consist of sandstone and shale and the numerous intervening valleys and broad prairie areas of comparatively smooth soils that also are underlain by deeply weathered sandstone and shale, with some limestone in places. There is little or no soil in the large bodies of rough stony land. In the valleys and prairies, soil development in many places has been arrested by the disturbing influence of erosion which has caused considerable bodies of thin immaturely developed soils. A number of soils of several series have been developed in the smoother areas. These soils differ in characteristics and in agricultural value, largely in relation to differences in the kind of soil parent material, the vegetative cover, and the relief. The characteristics and the features of the soils and their environments determine the value of the soils in their adaptations to crops and their productiveness. The alluvial soils of the stream bottoms are the most productive of the arable soils, especially for such crops as corn and alfalfa. Their agricultural value is limited, however, on account of occasional losses of a part of or all the crops by overflows. The soils ranking next in productiveness are the Prairie soils, especially those having friable subsoils and smooth well-drained surface soils. The third class includes the light-colored sandy timbered soils which, although especially suited to truck crops, fruits, and other crops, are of only moderate productiveness.

About 55 percent of the land is in farms, but in 1934 the cropland harvested on the 95 percent of the farms reporting amounted to only 17.5 percent of the total land area of the county. About 46.6 percent, largely rough stony land and nonarable land, is utilized only for the sparse pasturage afforded by the thin growth of coarse grasses and for the timber obtained from the oak and in places pine forests.

The agriculture of this county is typical of general farming practices prevalent throughout southeastern Oklahoma. Most of the farms are small and are worked by from one to four horses. Practically all the farming operations are carried on by the farmer's family, without the aid of hired labor. Cotton, although grown only in small fields, is the chief cash crop. Much of the farm land

is devoted to providing food crops and feed for livestock. In the central part of the county, where the population is densest, some truck farming and dairying are carried on. In some years certain truck crops have been grown and shipped in large quantities. The pastures are composed chiefly of native grasses, most of which are coarse and not highly nutritious.

Most of the upland soils are low in organic matter and are not highly productive. In general they respond well to fertilization and to good methods of farming, which include providing organic matter and protecting the soil from washing. Many farms, especially on the sloping lands, are severely eroded and have a run-down, neglected appearance.

The most prevalent type of farming includes the growing of corn, oats, and hay, in addition to cotton. Corn and cotton are grown on most of the farms, regardless of the suitability of the soils for these crops. Peanuts, potatoes, onions, and sweetpotatoes are special cash crops.

Cotton, the principal cash crop, is grown on nearly all farms. The highest yields are obtained on some of the well-drained alluvial soils. This crop also grows well on many other soils, especially when careful methods of preserving and increasing soil fertility are employed. Because this is the chief and practically the only cash crop, it is universally grown and is the most carefully tended crop.

Corn is the principal feed crop, and the acreage far exceeds that of cotton, which in times past was larger than that of corn. Although corn is grown on practically all farms, it is planted more commonly on the alluvial soils than on the upland soils. The alluvial soils are more fertile for corn, as they have a larger content of available plant nutrients, and the physical and moisture relationships of most of the alluvial soils make them better suited to corn than are the other soils of the county. Furthermore, these soils are not so subject to erosion when cultivated, as are many of the more rolling upland soils. Corn is grown for local and home use in feeding the farm livestock and to some extent for corn meal for bread.

Small quantities of grain sorghums, largely hegari, are grown for grain. The grain sorghums withstand periods of drought better than corn and for that reason are replacing corn to some extent on the upland soils. A much larger acreage of the sorghums is grown for silage, hay, and fodder than for grain. Oats, another important grain crop, are produced more generally on the Prairie soils and on some of the heavier alluvial soils. On the deeper smooth soils, excellent yields of oats are obtained in good seasons, but the average acre production for the county is low.

Miscellaneous hay and forage crops are of several kinds and are grown to some extent on every farm for the farm livestock. They include sorgo, grain sorghums, native-grass hay, and small quantities of tame grasses, alfalfa, and annual legumes. Yields of hay and fodder ordinarily range from 1 ton to 3 tons an acre. In general, the highest yields are obtained on the alluvial soils.

Orchard fruits, small fruits, vegetables, and truck crops are grown in small plantings around many of the farm homes for producing the needed foodstuffs required for home use. On some farms a surplus of these crops is produced and sold on local markets. The upland

light-textured soils developed under a forest growth seem to be the most suitable for orchard fruits, vegetables, truck crops, small fruits, and berries. These soils are used for the commercial production of truck crops, especially of watermelons, sweetpotatoes, peanuts, cantaloups, potatoes, onions, and berries.

The soils of this county, considered from an agricultural point of view, may be classed in two general groups (1) arable, or agricultural, soils and (2) nonarable soils. The arable soils include all the soils which physically are capable of being cultivated and which under ordinary conditions produce from moderate to good yields. The nonarable soils consist chiefly of stony and rough land, most areas of which have insufficient soil development to be classed as soils in the true sense of the word.

In the following pages, the soils of Pittsburg County are described in detail, and their agricultural relationships are discussed; their location and distribution are shown on the accompanying soil map; and their acreage and proportionate extent are given in table 3.

TABLE 3.—*Acreage and proportionate extent of the soils mapped in Pittsburg County, Okla.*

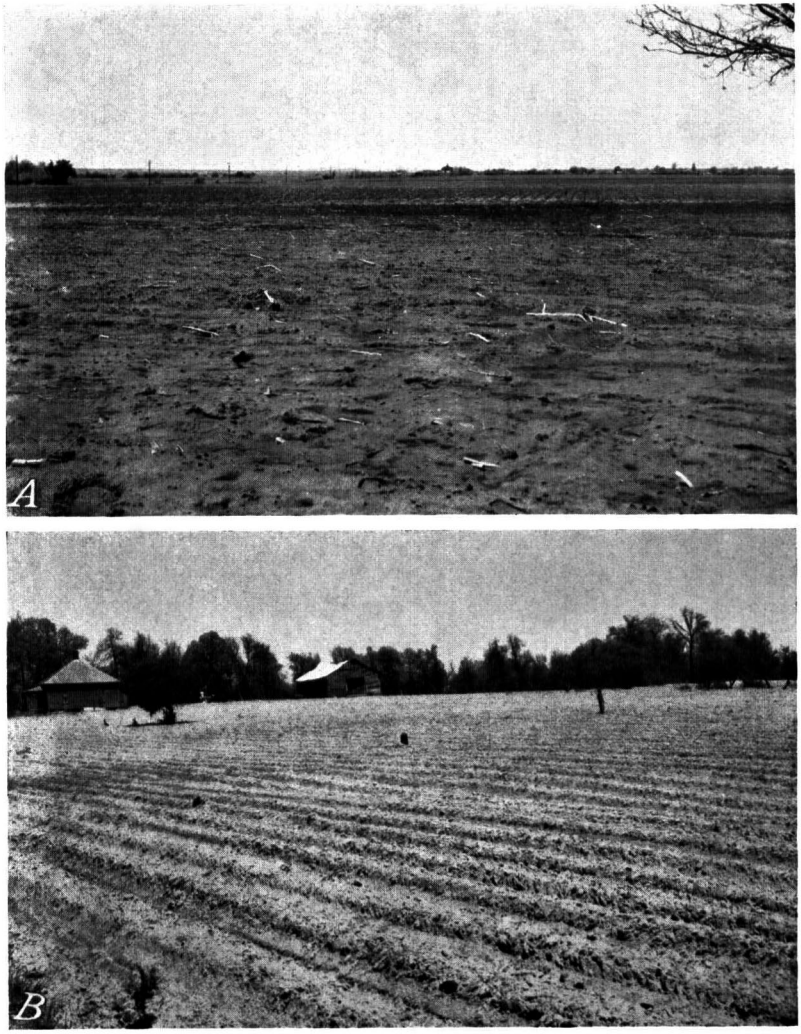
Type of soil	Acres	Percent	Type of soil	Acres	Percent
Teller fine sandy loam	19,200	2.2	Pope very fine sandy loam	28,800	3.3
Hanceville fine sandy loam	7,104	.8	Pope fine sandy loam	13,632	1.5
Conway fine sandy loam	76,288	8.7	Atkins silt loam	7,360	.8
Conway fine sand	17,600	2.0	Atkins silty clay loam	2,880	.3
Bates very fine sandy loam	107,200	12.2	Verdigris silty clay loam	2,304	.3
Bates fine sandy loam	24,384	2.8	Talihina stony silty clay loam	75,200	8.6
Parsons very fine sandy loam	76,736	8.8	Rough stony land (Leslie soil material)	8,384	1.0
Durant silty clay loam	9,536	1.1	Rough stony land (Hanceville soil material)	384,448	43.8
Leslie silty clay loam	5,184	.6			
Talihina silty clay loam	1,856	.2			
Yahola very fine sandy loam	1,152	.1			
Yahola loamy very fine sand	7,552	.9	Total	876,800	

AGRICULTURAL OR ARABLE SOILS

The agricultural, or arable, soils are of three main divisions, each comprising soils that are similar in texture and color as well as in general suitability to crops. To a considerable degree, most of them rank about the same in productiveness for the crops to which they are best suited. These divisions are as follows: (1) Light-colored forested upland soils, (2) brown Prairie soils, and (3) alluvial soils.

LIGHT-COLORED FORESTED UPLAND SOILS

The light-colored forested upland soils have gray or grayish-brown sandy surface soils underlain by yellow or red friable subsoils which range from fine sand to sandy clay in texture. These soils occur in small widely separated areas throughout many parts of the county, in association with various soils of other groups. The soils are low in organic matter and are especially deficient in nitrogen and phosphorus. They are moderately productive in the smoother areas and in places where the surface soils have been conserved by practices tending to prevent erosion and loss of organic matter. Most of these soils doubtless would respond well to fertilization when mois-



A, Typical area of Teller fine sandy loam; *B*, farmstead on Conway fine sand.

ture conditions are favorable. In the virgin condition these soils support a forest growth of post oak and blackjack oak, with some hickory. In general the relief is undulating or gently rolling, and drainage is good. Owing to cultivation of the land without protection from washing, erosion of slopes, largely by gullying, is excessive in places. These soils are largely in cultivation, and the principal crops grown are cotton, corn, and forage crops. In some sections, truck crops are successfully grown for market.

The soils of this group are Teller fine sandy loam, Hanceville fine sandy loam, Conway fine sandy loam, and Conway fine sand.

Teller fine sandy loam.—The 8- or 10-inch topsoil of Teller fine sandy loam is light-brown fine sandy loam which in places has a reddish hue. It grades into red or brownish-red friable permeable fine sandy clay, the color of which, with increase in depth, changes to yellowish red. This sandy clay material is many feet thick. The relief of the typical soil is smoothly undulating (pl. 1, *A*). Included with this soil as mapped are areas of a rolling phase of Teller fine sandy loam. This soil is similar to the typical soil, but it is more sloping, is subject to greater erosion, and the soil material is very thin in places. In such places, there are small eroded spots and gullies and some very deep vertical-banked gullies. In places the topsoil is sufficiently light that it blows readily in heavy winds. Small areas of the Stidham soils, which have brown fine sandy loam surface soils and brown or yellowish-brown subsoils, also are included, as these soils closely resemble Teller fine sandy loam in texture and productiveness.

Teller fine sandy loam has developed under a forest cover of oaks, but most of the land is now in cultivation. It is a friable soil that collects and holds rain water well, although it is subject to deep gullying on unprotected slopes. This soil, although slightly acid, is suited to many crops, and the favorable moisture conditions, ease of cultivation, and good productivity cause all the land to be cultivated. Under cultivation the organic matter has been considerably depleted on many farms.

This soil occupies a total area of 30 square miles. It occurs only on a number of high undulating terraces consisting of old river deposits. The red color of the material indicates its origin in the "Red Beds" of the west, through which Canadian River flows. Areas of this soil bordering the Canadian River Valley lie 50 or more feet above the flood plain along the river. The larger bodies are in the vicinity of Indianola.

Both internal and surface drainage are very good. Gullies rapidly develop on slopes, if allowed to start.

This soil is used largely in the production of corn and cotton, and about equal acreages are devoted to each crop. According to local information, yields of cotton on the smoothest fields range from one-half to three-fourths of a bale an acre and corn from 25 to 35 bushels. It has been reported that the soil responds well to the use of phosphorus in commercial fertilizers, and doubtless the long-farmed soils would also respond to nitrogen. This soil is well suited to most truck crops, fruits, and berries. In some years, considerable quantities of onions, potatoes, and tomatoes have been produced on a commercial basis and are shipped to outside markets. Peanuts,

peas, watermelons, and sweetpotatoes also are produced rather extensively in some years.

Hanceville fine sandy loam.—The topsoil of Hanceville fine sandy loam is brown or reddish-brown fine sandy loam averaging about 10 inches in thickness. It is much thinner in some of the more sloping areas. In some cultivated fields the topsoil is light colored. It is grayish brown to a depth of several inches and is underlain by a subsurface soil of reddish-yellow fine sandy loam. In the more typical areas, the topsoil grades into red fine sandy clay which varies considerably in texture from place to place. In some places it is moderately heavy though crumbly, and in others it is so low in clay content that it is a fine sandy loam. Below a depth of about 30 inches, or even less in places, the color is yellowish red. This material merges with disintegrated sandstone at a depth ranging from 2 to 5 feet or deeper. In the uncleared forested areas the topsoil consists of a thin loose light-colored layer overlying yellow or reddish-yellow light sandy material which grades into the red sandy clay subsoil. The surface soil and subsoil are acid in reaction, and the soil is low in organic matter, especially in fields that have been in cultivation for a long time. In places, disintegrated sandstone parent material lies so near the surface that the soil layers are very thin, and these shallow areas are of less value for the production of crops than the more typical soil.

Hanceville fine sandy loam is not of great extent in any one area, and the several widely separated small bodies comprise a total area of only 11.1 square miles. This soil occurs on the high smooth valley lands or adjacent to the ridges of sandstone and has good surface drainage and underdrainage. It is susceptible to rapid gully erosion on unprotected slopes.

The native tree growth is mainly post oak, blackjack oak, and hickory. Most of the land is in cultivation to general farm crops, especially corn and cotton. On the smoother, better fields, yields of corn range from 20 to 30 bushels an acre and of cotton from one-fourth to one-half bale, but on fields that have not been well cared for, yields are lower. Cotton on this soil probably would respond to fertilizers containing phosphorus and nitrogen. The soil is suited to fruits, berries, peanuts, melons, sweetpotatoes, and various vegetables, all of which are grown to some extent for home and local use. This is not considered a valuable soil for small grains, but sorgo and grain sorghums do well.

Conway fine sandy loam.—In virgin areas, the surface soil of Conway fine sandy loam consists of gray or grayish-brown fine sandy loam or loamy fine sand several inches thick, grading into yellow fine sandy loam. This material, at a depth ranging from 15 to 20 inches, grades into a yellow friable fine sandy clay subsoil which, below a depth of 2 feet contains some gray spots and mottlings, also a few red spots and small dark concretions. The soil is of acid reaction and is apparently low in organic matter. Sandstone lies several feet beneath the surface.

This soil occurs in many widely scattered bodies. They comprise a total area of 119.2 square miles. The soil occupies high smoothly undulating areas of the valleys and smooth lands, in association with low ridges near sandstone outcrops and in places is surrounded by

soils of the Bates series. The land has good surface drainage and free underdrainage. Small sand mounds are present.

The native tree growth consists chiefly of post oak, blackjack oak, persimmon, and hickory. A thin stand of coarse grasses grows in the forested areas.

Much of this soil is in cultivation to general farm crops, mainly corn, cotton, and forage crops. The smooth areas are fairly productive, and local reports indicate that corn yields from 15 to 25 bushels an acre and cotton from one-fourth to one-half bale. Doubtless some of the older fields, which have not been protected from washing and have been depleted of organic matter and plant nutrients by long periods of cropping, produce much lower yields. The soil is suited to fruits, vegetables, and berries, also to watermelons, peanuts, peas, and sweetpotatoes, which are grown chiefly for home use. Although the soil is well suited to the production of truck crops and fruits for market, fertilizers would probably be necessary for these special crops. It is believed that the soil is more deficient in phosphorus and nitrogen than in other plant nutrients. The soil may be improved by growing and plowing under field peas, as the large supply of organic matter maintained in the soil causes much improvement in productiveness.

Conway fine sand.—The 4- to 8-inch surface layer of Conway fine sand is gray or grayish-brown fine sand. It grades into yellow fine sand which continues to a depth of several feet. In places the subsoil grades, at a depth ranging from 2 to 4 feet, into yellow fine sandy loam or fine sandy clay. The sandstone parent material lies at a depth of several feet below the surface. The topsoil is very light, loose, low in organic matter, and acid in reaction. In cultivated fields it is subject to blowing and drifting in early spring when there is no protective vegetative cover. The subsoil is porous and allows rapid underdrainage and consequent leaching of the material in all soil layers.

This soil occurs in a few bodies widely separated throughout the smoothly undulating valley areas and in places is surrounded by Prairie soils. The total area is 27.5 square miles.

Drainage ranges from good to excessive. The uncultivated areas support a heavy growth of post oak and blackjack oak trees. Much of the land is in cultivation, although this is a thin soil of low productivity. Cotton, corn, and some sorghums, peas, and peanuts are grown, yields of which are normally somewhat lower than on Conway fine sandy loam. The soil is well suited to the vine crops, fruits, and berries, and some of these are grown. Watermelons, beans, tomatoes, sweetpotatoes, and various vegetables are grown to a small extent for home use and for local markets. Some farmers have reported that crops on this soil respond very favorably to fertilizers comparatively high in phosphorus and nitrogen. Plate 1, *B*, shows the relief and general appearance of Conway fine sand.

BROWN PRAIRIE SOILS

The brown Prairie soils make up the largest proportion of farming lands in Pittsburg County. They have light-brown surface soils, some of which dry to a rather gray color, and the subsoils range from light friable sandy clay to dense and heavy materials. All these soils

have moderately good drainage, although underdrainage is slow in places, as the relief ranges from undulating to gently rolling. The soils have developed from shale or from interbedded layers of shale and sandstone. Most of the soils are acid in reaction, are not high in organic matter, and are not especially rich in the essential plant nutrients. For the most part they are of fine or very fine sandy texture. Small areas of heavier soils are in the group. The soils of this group differ from the light-colored soils of group 1, in that they are used to a great extent for small grains, mainly oats, and for cotton and corn. They are moderately productive, though in places they have been injuriously affected both by gully and sheet erosion.

The soils of this group are Bates very fine sandy loam, Bates fine sandy loam, Parsons very fine sandy loam, Durant silty clay loam, Leslie silty clay loam, and Talihina silty clay loam. The native vegetation is largely coarse grasses, mainly of the *Andropogon* species.

The Bates soils have deep friable light-brown surface soils and crumbly friable or moderately heavy yellow or mottled yellow and gray subsoils. The Parsons soils have light-brown moderately deep friable surface soils and dense heavy clay subsoils. The Durant soils have brown surface soils and brown or yellowish-brown heavy subsoils which are not so dense or heavy as the subsoils of the Parsons soils. The Leslie soils have dark surface soils with brown or yellow subsoils. They are of very small extent but are productive. The Talihina soils have developed from beds of shale, which have not weathered deeply. They have dense waxy subsoils. These soils are not highly productive.

Bates very fine sandy loam.—The 8- to 12-inch surface layer of Bates very fine sandy loam is grayish-brown very fine sandy loam. It grades into brown, yellowish-brown, or brownish-yellow somewhat heavier very fine sandy loam or clay loam, and this, at a depth of about 18 inches, grades into yellow friable crumbly clay which in many places contains mottlings of gray. The clay subsoil becomes heavier with increase in depth and in many places contains some red splotches and black concretions. This soil has developed from shale which lies several feet beneath the surface and has weathered deeply. In places the subsoil is heavy, and small spots having a definite claypan character occur in places. Such included areas are Parsons very fine sandy loam, that are too small to show separately. Small round mounds of fine sand and very fine sand are scattered over the surface. A large area of the soil mapped near Indianola has smooth flat relief and a very deeply developed subsoil, with no indication of shale. In that place, the parent material may be an old terrace of alluvium, lying very high above the Canadian River Valley which it borders. The soil occurs in comparatively large and many small areas throughout much of the prairie section.

The surface soil and subsoil seem to contain but a slight quantity of organic matter and are acid in reaction. The surface soil is friable and easily cultivated, and the permeable subsoil allows ready penetration of plant roots. In some of the narrow valleys extending between the high sandstone ridges, some very small spots of this soil have a subsoil of cemented fine rock fragments. In these valleys there are also flat strips of Parsons silt loam, which, on account of their small extent, could not be mapped separately.

The relief of Bates very fine sandy loam is undulating or gently rolling, and, for the most part, surface drainage and underdrainage are good. On some sloping areas the unprotected soil washes and forms deep narrow gullies which render the nearby land useless on account of its eroded condition.

The coarse grasses, largely of the *Andropogon* species, comprise the native vegetation. Probably about one-half of the land is in cultivation. The crops grown are mainly corn, oats, cotton, and forage crops, and some prairie grasses are cut for hay. According to local information, corn yields from 15 to 25 bushels an acre, oats 25 to 35 bushels, cotton about one-fourth bale, and prairie hay about three-fourths ton.

Although not especially suited to fruits and vegetables, some well-cared-for small orchards of apples, plums, and peaches do well, and the home gardens of vegetables and various truck crops return good yields. Bates very fine sandy loam occurs in many both small and large areas throughout the county. The total area is 167.5 square miles.

Bates fine sandy loam.—Bates fine sandy loam differs from Bates very fine sandy loam in that it has a slightly coarser textured and looser topsoil and a subsoil that is somewhat more friable and has a larger content of fine sand. The 12-inch topsoil is light grayish-brown fine sandy loam. It grades into yellowish-brown sandy loam which, below a depth ranging from about 15 to 18 inches, grades into yellow heavy fine sandy loam or fine sandy clay loam, containing some mottlings of gray and soft dark concretions and particles. In places the subsoil, below a depth ranging from 3 to 4 feet, is heavy gray and yellow mottled clay or clay loam. Small sand mounds are scattered over the surface.

Both surface soil and subsoil have developed deeply as a consequence of the undulating smooth relief, and both surface drainage and internal drainage are very good. In areas lying near areas of the light-colored forested soils, the soil appears to be transitional between the Prairie soils and those developed under forest. It is, however, a Prairie soil, is slightly acid, is low in organic matter, and is of but moderate productiveness. It occurs in widely scattered small bodies throughout the prairie sections.

The native vegetation consists mainly of coarse prairie grasses, and in places a few oak trees have encroached from adjacent forest land. The soil is largely in cultivation, and about the same general farm crops are grown as on Bates very fine sandy loam, although the proportion in oats possibly is smaller. Local reports indicate that yields of cotton, corn, oats, and other crops range from nearly as high as to 20 percent lower than those on Bates very fine sandy loam. The fine sandy loam seems suited to fruit trees and vegetables, as well as to peanuts, melons, onions, beans, sweetpotatoes, and other truck crops. Some of these crops are grown.

Parsons very fine sandy loam.—The surface appearance of Parsons very fine sandy loam is somewhat the same as that of Bates very fine sandy loam, but the Parsons soil differs from the Bates soil in that the subsoil is a dense clay of claypan character. The topsoil of Parsons very fine sandy loam is dark grayish-brown heavy very fine sandy loam to a depth of about 10 inches. In many places the lower

part of the topsoil consists of a 1- or 2-inch layer of light-gray material which is abruptly underlain by brown or yellowish-brown dense heavy clay. The lower part of the subsoil, below a depth of about 2 feet, contains, in many places, gray mottlings and some dark concretions. In some very flat situations are a few areas, too small to map separately, in which the topsoil is silt loam and very light in color, approaching in character Cherokee silt loam, a soil of considerable extent on the prairies of northeastern Oklahoma. In some areas the very heavy clay is not sharply separated from the topsoil, and there are some included small areas of Bates very fine sandy loam. Small sand mounds occur here and there over the surface. In a few places on some short slopes in narrow valleys, there is a slight cementation of the deep subsoil particles, iron pellets, and fine sandstone fragments.

Parsons very fine sandy loam has developed in areas of smooth relief, from deeply weathered beds of shale and in places from shale and sandstone. Surface drainage is slow, and underdrainage is very slow. The material in the flat areas, where it is densest, is almost impervious to plant roots and moisture. This soil occurs in many small widely scattered areas throughout the prairie sections of the county and in some of the narrow valleys. In some valleys, a few trees have encroached from the forested valley soils.

Probably not more than half of the land is in cultivation, and the rest is covered with the native prairie grasses (largely bluestems) which are pastured and cut for hay.

This soil is acid in reaction, has only a slight content of organic matter, and is not especially rich in plant nutrients. It seems to be fairly well suited to oats, and local reports state that in ordinary seasons from 20 to 30 or more bushels an acre are produced. Acre yields of corn range from 15 to 20 bushels and of cotton from one-fifth to one-half bale. Grain sorghums, mainly hegari, are grown to advantage. This soil is not especially suited to fruits or vegetables, but on the deeper and better drained areas, carefully tended home orchards and gardens produce sufficient foodstuffs to provide the requirements of the farm home.

Durant silty clay loam.—To a depth ranging from 8 to 12 inches Durant silty clay loam consists of brown or dark-brown silty clay loam. This material grades into heavy brown clay which passes, at a depth ranging from 12 to 15 inches, into heavy clay mottled brown, yellow, and gray, with greenish yellow predominating in places. Fine shale fragments occur in the subsoil, and the material grades into a bed of shale at a depth of several feet. A few fine slick sandstone particles are scattered over the surface and through the soil.

Durant silty clay loam is a Prairie soil, on which coarse bluestem grasses grow abundantly. A large proportion of the land is in cultivation. The relief in general is undulating or gently sloping. In places the land is eroded, and there are some steep gullies. Most of this soil lies several miles northwest of Kiowa in the southwestern part of the county. It is of moderate productiveness and is used largely for oats and cotton, together with some forage crops. It is reported that in ordinary seasons oats yield from 30 to 50 bushels an acre and cotton from one-fourth to one-half bale.

Leslie silty clay loam.—The 8-inch topsoil of Leslie silty clay loam is dark-brown or nearly black clay loam or silty clay loam. It

grades into yellowish-brown crumbly clay and this, below a depth of about 20 inches, passes into olive-yellow dense clay. In places the subsoil is mottled with red and brown and contains fine chert and limestone fragments.

This is a soil of very slight extent. It occupies short moderate slopes of very narrow areas following and paralleling steep limestone rock ridges in the southeastern part of the county a few miles southwest of Hartshorne. A few oak and elm trees are on the land, but most of the soil is in cultivation. The principal crops are corn, oats, cotton, and some grain sorghums. Yields are probably somewhat higher than on Durant silty clay loam. Some alfalfa and sweetclover are grown in very small fields with some success. The slight extent of the soil and its occurrence in small areas intermingled with associated soils render it of no especial importance as an agricultural soil.

Talihina silty clay loam.—Talihina silty clay loam, to a depth of about 10 inches, consists of brown silty clay loam or waxy clay, containing a considerable quantity of fine shale particles which give the material a slick greasy feel. In places fine and small yellowish-brown slick sandstone or shale particles occur. This layer is underlain by gummy, waxy, brown or reddish-brown clay, and this, below a depth ranging from 1 to 2 feet, passes into yellow and dull-gray, mottled, waxy clay which contains many fine shale particles. Shale beds lie beneath this soil, and in places the parent material is near the surface.

This soil occurs in only a few small areas in the southwestern part of the county, largely in association with bodies of Durant silty clay loam. Apparently it is developed from about the same material as that soil. It is well-drained rolling prairie land cut by many gullies. The native grasses are bluestem, three-awn, and some grama. Very little of the land is cultivated, as the soil is so shallow and is low in productivity. Some cotton is grown, but yields are very low.

ALLUVIAL SOILS

The group of alluvial soils comprises the bottom lands which occupy the flood plains of the streams. These soils are developed from deep beds of water-deposited materials that have been washed from the uplands. As they are subject to occasional overflows and continued deposition of soil materials from time to time these deep soils have a comparatively high content of organic matter and available plant nutrients. Along Canadian River the deposits are largely materials from the western plains, and along the smaller streams they are sediments brought from the prairie and forested uplands of the county. In the virgin condition these soils support a forest growth of elm, water oak, bur oak, pecan, and other trees. The soils comprising the group are Yahola very fine sandy loam, Yahola loamy very fine sand, Pope fine sandy loam, Pope very fine sandy loam, Atkins silt loam, Atkins silty clay loam, and Verdigris silty clay loam.

The Yahola soils have red or reddish-brown calcareous surface soils and very light textured subsoils. They occur along streams that drain areas to the west, and the soil materials have been washed largely from soils of the "Red Beds." They are moderately productive. The

Pope soils are light-brown or grayish-brown well-drained soils consisting of soil materials washed from the prairies and forested areas of the county. They have gray compact subsoils. The Atkins soils are light-colored poorly drained soils along streams which drain the local upland prairies and forested sandy soils. They have brown or yellowish-brown heavy tight subsoils.

Yahola very fine sandy loam.—The 12- to 15-inch surface soil of Yahola very fine sandy loam consists of red or reddish-chocolate-brown very fine sandy loam having an appreciably smooth velvety feel, owing to a considerable content of silt. It grades into a subsoil which is variable in texture but, in general, consists of lighter colored and lighter textured materials occurring either as a deep uniform bed or as strata of sandy material, through which are thin bands or layers of heavier reddish-brown soil material. In many places the subsoil is reddish-brown or light-red very fine sandy loam or loamy very fine sand, which includes layers from 1 to 5 inches thick of silt loam or silty clay loam, but in most places, below a depth of 2 feet, there is yellowish-red or yellow rather light loamy very fine sand. The surface soil and subsoil are calcareous throughout. A heavy phase of Yahola very fine sandy loam consists of a 10-inch layer of reddish-brown very fine sandy loam which grades into reddish-brown or brownish-red crumbly clay loam and this, at a depth ranging from 18 to 24 inches, grades into a layer of reddish-yellow loamy very fine sand several feet thick. An area of this kind is in the extreme northwestern corner of the county along Canadian River, just south of the highway bridge. A light phase of this soil consists of a 15-inch layer of reddish-brown very fine sandy loam underlain by reddish-yellow very fine sand. The lines of demarcation between areas of Yahola very fine sandy loam and those of Yahola loamy very fine sand are very indistinct. A gradual transition of one soil into the other takes place, and each soil has included with it small areas of the other.

Yahola very fine sandy loam occurs as high-bottom areas on the Canadian River flood plain. The relief is smooth, and occasionally overflows cover the surface with water, but drainage is adequate for cultivation, and practically all of the land is in crops.

Owing to its fairly high productiveness in the better areas where the subsoil is not excessively sandy and loose, this is a highly esteemed soil. Corn, cotton, and some forage crops are grown, and in places small quantities of alfalfa have been produced successfully. Local authorities state that the acre yields in normal seasons are about as follows: Corn 30 to 40 bushels, cotton one-half to 1 bale, and alfalfa 3 to 5 tons from a total of several cuttings a season.

Yahola loamy very fine sand.—To a depth ranging from 12 to 15 inches, Yahola loamy very fine sand is reddish-brown or light chocolate-brown loamy very fine sand. This material grades into reddish-yellow loamy very fine sand which passes, at a depth ranging from 18 to 30 inches, into light-yellow or reddish-yellow very fine sand or, in places, fine sand. The subsoil is variable but as a rule has not the thin layers of heavier material, such as occur in the subsoil of Yahola very fine sandy loam. As a rule, this soil occupies areas of bottom land lying between Yahola very fine sandy loam and the river. The better areas of the soil, that is, those in which the soil is not exceedingly light

and loose in the subsoil, are in cultivation in association with bodies of Yahola very fine sandy loam. The land is used for the same crops as are grown on the very fine sandy loam, but yields are considerably lower, especially in dry seasons, owing to the unfavorable moisture-holding condition of the subsoil.

Included with this soil are some slightly lower terraces on the inner bends of the river, which consist of very light slightly silty very fine sand underlain by gray or yellow very fine sand or fine sand. Such areas are considered too sandy for cultivation, as the loose sandy subsoil does not hold moisture well. Here, the soil supports a scattered growth of cottonwoods and willows and locally is called "quicksand" land. It is used chiefly for pastures. Bermuda grass provides good grazing until the hot weather of summer, when it dries and provides little or no feed for livestock.

Yahola loamy very fine sand occurs in a number of good-sized bodies along Canadian River in the northern part of the county.

Pope very fine sandy loam.—The surface soil of Pope very fine sandy loam is grayish-brown or light-brown very fine sandy loam which grades into gray or light-brown fine sandy clay slightly mottled with yellow. Below a depth of about 2 feet the subsoil is gray or gray and yellow mottled compact clay containing ferruginous pellets.

Although it is overflowed occasionally, the soil has good natural drainage, and much of the land is cultivated. This soil is well suited to cotton and corn, and a large proportion of the cultivated land is used for those crops. According to local estimates, corn yields from 25 to 60 bushels an acre and cotton from one-half to 1 bale. In some years, overflows and the boll weevil cause losses of crops.

Pope fine sandy loam.—The 10- to 15-inch surface layer of Pope fine sandy loam consists of brown fine sandy loam. It is underlain by brown clay or clay loam, which, below a depth ranging from 2 to 3 feet, grades into a gray clay subsoil containing brownish-yellow mottlings and brown pellets and iron stains throughout. This soil is suited to the same crops as is Pope very fine sandy loam. The utilization of the land and the crop results obtained are about the same as for that soil.

Atkins silt loam.—The topsoil of Atkins silt loam is gray silt loam about 8 inches thick, which, on drying, is almost white. This material grades into heavy brown or gray clay or clay loam, which is rather compact when dry. This soil occupies high bottom lands along Gaines Creek, and in places it constitutes a low second bottom. It is reported that the land is overflowed occasionally. Surface drainage is slow, and underdrainage is very deficient.

This soil supports a growth of trees, chiefly water oak, elm, and haw. Not a large acreage of the land is in cultivation. On drying the soil tends to crust and become very hard. Only very small quantities of cotton and corn are grown, and yields of these crops are said to be very low.

Atkins silty clay loam.—The 10- to 12-inch topsoil of Atkins silty clay loam is gray or grayish-brown silty clay loam. This material grades into dark-gray silty clay containing dark iron stains and brown mottlings. Below a depth ranging from 12 to 20 inches, the subsoil is gray compact clay loam or clay, mottled brown or yellow.

which contains pellets of dark ferruginous material. The relief is flat, and drainage is slow, both from the surface and internally. Both surface soil and subsoil are acid in reaction. Little of the land is cultivated. Most of it is in pasture, and in places the native grasses make a good growth. Some small grains are grown, and yields are moderate.

Verdigris silty clay loam.—The topsoil of Verdigris silty clay loam is brown or dark-brown silty clay loam about 12 inches thick. It grades into brown or dark-brown silty clay loam or crumbly clay, and, below a depth of about 24 inches, the material is mottled gray and brown crumbly clay. This is high smooth soil along streams draining some good-sized areas of Prairie soils. The surface soil is slightly acid, but some tests have indicated that, in places, a calcareous condition of the material exists at a depth of several feet. Some of the land is in cultivation, and good yields of cotton have been obtained. The native tree growth is largely several species of oak, elm, haw, locust, and shittim wood. This soil is of slight extent. It occurs in only a few areas along Gaines Creek in the northeastern part of the county.

NONARABLE SOILS

The nonarable soils include soils or types of land, which are physically impossible to cultivate or which, although they may be cultivated with difficulty, are not suitable for the economical production of crops.

Talihina stony silty clay loam.—Talihina stony silty clay loam is a rolling Prairie soil which in places is hilly and steeply sloping. The topsoil is brown silty clay loam about 8 inches thick, but in places it is much thinner. This material grades into dense brown or brownish-yellow clay mottled with gray in the lower part of the layer. Fine shale particles give the subsoil a slick greasy feel. In a few small areas some of the topsoil contains appreciable quantities of sandy material. The surface is strewn with sandstone blocks, many of which are square or rectangular. The subsoil material grades into a bed of shale lying at a depth of several feet. Stony material does not occur at a great depth and for the most part lies on the surface.

The land supports a growth of coarse grasses, such as bluestems and some grama. A few shrubs and trees of elm, oak, haw, and persimmon are present. The soil is used only for pasturing cattle. Local farmers state that from 6 to 12 acres a head are required to furnish adequate grazing.

Rough stony land (Leslie soil material).—Rough stony land (Leslie soil material) consists of steep narrow ridges of limestone outcrops with a little fine earth of brown loam or clay loam between the rocks. The ridges are exceedingly stony, with massive boulders and uptilted ledges. Little grass grows on the land. A growth of oaks, hickory, and some other trees obtains a foothold between the rocks. This rough land affords very little grazing. It is of moderate extent and occupies but a few narrow areas in the southeastern part of the county. The limestone from some areas has been used for the manufacture of cement.

Rough stony land (Hanceville soil material).—Rough stony land (Hanceville soil material) is a very extensively developed rough land occupying a total area of 600.7 square miles. It includes high hills and ridges or steep slopes covered with massive and some small fragments and outcropping ledges of sandstone. These hills are of mountainous character in the eastern part of the county, where they represent the western extension of the rough lands of the Ouachita province. The fine-earth material is brown or gray fine sand or fine sandy loam on the surface, and between the rocks, at a depth of a few inches, it is yellow fine sandy loam. In places where there is a slight development of soil the subsoil is red. On a number of low ridges and slopes, at the foot of the large hills or in other places, soil has developed with only small rocks present, and the rough and massive rocks are lacking. Such areas are Hanceville stony loam and are included with this rough stony land because they are noncultivable. On many slopes the shale beds outcrop or have only a slight covering of soil material which is largely covered by numerous stones fallen from the higher sandstone outcrops.

The largest areas of the Hanceville type of rough stony land are in the eastern and northwestern parts of the county. The land is covered with a tree growth consisting largely of post oak, blackjack oak, and hickory. The grasses are of the coarser varieties. In most places the stand is sparse, and the grasses do not provide much pasturage.

RECOMMENDATIONS FOR THE MANAGEMENT OF PITTSBURG COUNTY SOILS [2]

The two most important problems in the management of Pittsburg County soils are associated with the production of better pastures and the maintenance of soil fertility in cultivated areas. Since a large part of this county is composed of soils which are either too stony or too poor to be used for cultivated crops, the proper use of the land is for pasture. In places overgrazing has seriously damaged or destroyed the native grasses which were present in the virgin prairie, and now many pastures have a very low carrying capacity for livestock. If the native grass in a pasture is in a weakened condition, due to overgrazing, rest for at least 2 years will allow the small plants to increase in size, and the pasture will be improved as a result of this treatment. Weeds should be clipped, if a mower can be operated on the land, in order to conserve moisture and plant nutrients which are needed for the growth of grass. Where the native vegetation has been destroyed by cultivation or overgrazing, roots or stolons can be planted or seed can be scattered over the area, in order to reestablish the pasture. Experiments indicate that seed planted in rows and cultivated the first season will give better results than seed broadcast, which results in the young plants having to compete with other vegetation. Restricted grazing or a rotation system that will allow the grass to produce seed is necessary, in order to improve the stand of the more desirable species of grass. Grama grass seed is easier to obtain than little bluestem seed, and grama will

[2] This section of the report was written by H. J. Harper, professor of soils, agronomy department, Oklahoma Agricultural and Mechanical College.

withstand unfavorable weather conditions as well as overgrazing. Both grasses, however, are very desirable for use in improving the pastures.

Since the seed of many cultivated grasses and legumes can be obtained from commercial sources, the average individual will probably prefer to follow a program of pasture improvement by using such plants as Dallis grass, Bermuda grass, Korean lespedeza, and little hop clover in preference to the establishment of native grasses, such as little bluestem or grama. Dallis grass is a very desirable grass and should be planted, especially in lowlands where moisture conditions are more favorable for plant development. Korean lespedeza is a legume which will make good growth on comparatively poor soils. The seed should be planted about the last of March. This plant is drought resistant and will provide grazing for livestock from June until frost. Black medic will produce an abundant growth on soils containing a good supply of plant nutrients, and this legume is one of the best plants to use for pasture improvement on good soils. Little hop clover is a winter annual, and the seed should be scattered in the pasture in July or August. The plant begins to grow as soon as moisture conditions are favorable in the fall. The young plants are dormant during the winter, and they begin to grow again in February or early March. Optimum grazing will be produced during April and May. On soils low in phosphorus or which are acid, lespedeza and other legumes cannot be expected to make a vigorous growth. Bermuda grass will make a good growth on soils that are not too low in fertility. It is one of the best pasture grasses because it is adapted to the climatic conditions prevailing in this general area, and when used in a pasture with Korean lespedeza, hop clover, and Dallis grass, forage should be available for livestock during the greater part of the year. Sudan grass should be grown for summer pasture. It may be sown in rows about 21 inches apart and cultivated, or it may be drilled in narrow-spaced rows or broadcast about the first of May. If this grass is not needed for pasture, it may be cut for hay.

Under present economic conditions, it is not probable that fertilizer or lime will be applied to any appreciable acreage of pasture land, although the gradual removal of minerals by the grazing animals and, in places, by soil erosion will decrease the fertility of soils used for the production of grass. Consequently it is only a matter of time before the production of forage will decline even on a fertile area of land. Fertilizers will be needed, in order to provide conditions more favorable for the growth of vegetation.

Weeds in a pasture generally can be controlled by introducing a few sheep, although some weeds cannot be controlled by this method. Goats are frequently used to destroy brush and undesirable vegetation which appear in many areas of grassland. If it is necessary to concentrate a large number of goats on a limited area of land, in order to control the brush, damage may occur from soil erosion if the surface of the ground is exposed for some time before the sprouts are completely destroyed. It is important to save the surface soil on virgin areas of land, because the surface soil contains more organic matter and the minerals needed for plant growth than any other part of the soil profile. The construction of terrace ridges or contour

furrows may be necessary on many areas, in order to reduce losses which occur through run-off of water.

The cultivated soils in Pittsburg County are variable in natural fertility. The greater part of them are very low in available plant nutrients. No attempt has been made by the average farmer to maintain the organic matter and nitrogen content of the soil. In many fields no effort has been made to control soil erosion, and, on sloping land, row crops, such as corn and cotton, have accelerated the rate of erosion because the surface layer has been exposed to the destructive effect of run-off water, and the rows, instead of being laid out on a contour, have been laid out parallel with the slope. On most farms, a cash-crop system of farming has been followed, and very little fertility has been returned to the soil. A few farmers have learned that corn grown in alternate rows with cowpeas is an excellent method to use, in order to increase corn yields on poor land. Although this system of farming will add nitrogen to the soil, it is not a permanent system, because the removal of corn, cotton, or small grain removes not only nitrogen but other minerals which are not supplied when cowpeas or other legumes are grown and plowed into the soil. The addition of a fertilizer containing phosphorus and potash to the land for corn and cowpeas is needed on most soils, in order to maintain and improve crop yields.

Methods of fertilization and the use of lime on acid soils are important problems which the average farmer in this county must consider, in order to increase crop production on the greater part of the soils. Ninety samples of surface soil, collected from different parts of the county, have been analyzed for readily available phosphorus. Sixty-nine of these samples were either low or very low in this important nutrient. Twenty-one samples were medium in readily available phosphorus, eight were high, and only two were very high. These analyses indicate that more than 75 percent of the cultivated soils are very deficient in phosphorus and that maximum crop production cannot take place unless a system of soil improvement which includes the use of a phosphatic fertilizer is adopted.

Soil acidity also is an important problem. The results of analyses of 198 samples of surface soil show that 41 soils were strongly acid, 63 were medium or medium acid+, 60 were slightly acid, 22 were neutral, and only 12 were basic in reaction, which means that some undecomposed limestone is present in them. A good potential supply of limestone is available along the Choctaw fault which begins in the southwestern part and extends in a northeasterly direction across the county. The purity of this limestone varies, but many of the ledges contain more than 95 percent of calcium carbonate. Portable limestone pulverizers could be used to supply local communities with agricultural limestone. The cost of grinding agricultural limestone ranges from $2 to $3 a ton, depending on the cost of quarrying and the hardness of the rock. Limestone should be pulverized so that at least one-half of it is a fine powder before it is applied to the soil. Corn, oats, cotton, and grass are not affected by soil acidity so much as are legume crops which are needed to increase the nitrogen content in both cultivated fields and pasture land. Some legume crops, such as cowpeas and soybeans, are more tolerant of acid soil than crops like alfalfa and sweetclover. Data show, however, that lime is needed

on acid soils, in order to increase the efficiency of nitrogen-fixing bacteria which grow on the roots of legume crops. Consequently the addition of finely ground limestone to acid soils is essential in any program of soil improvement.

Some of the soils along the Choctaw fault and adjacent to streams are not acid, and alfalfa can be produced on them without fertilization. Alfalfa is an important crop, and where well-drained fertile soil is available on a farm this crop should be grown. In many fields 2 or 3 tons of finely ground limestone per acre should be applied before the alfalfa seed is planted. Applications of phosphate fertilizers and, on some fields, potash will be necessary in order to produce maximum yields. Two of the important problems in the production of alfalfa are the harmful effects of excess moisture and the competition from crabgrass. Careful examination of the soil will indicate whether drainage is satisfactory, and fall planting will aid in eliminating weeds and grasses the following year.

Hairy vetch is an important legume for soil improvement, and this crop will provide some grazing in April and May. It should be planted on a good seedbed, following small grain or between cotton rows, as soon as moisture conditions are favorable late in September or early in October. This crop may be plowed under as a green-manure crop, and a summer legume or a grain-sorghum crop may be planted in shallow lister furrows as soon as the vetch has made a maximum growth.

Golden mung beans have made an excellent growth in several demonstrations conducted in this county. This is a good crop for the production of forage and should be planted about the same time that cowpeas are planted. Early planting is more favorable for a maximum production of forage. If Golden mung beans are planted following a crop of small grain, a good crop of seed will be produced, and this is one of the best methods to use for the production of seed. Soybeans are adapted to both soil and climatic conditions. As the fertility requirement of soybeans is high, however, fertilizers containing phosphorus and potash should be applied to most soils, in order to produce satisfactory yields, especially when the forage is removed and no residues are returned to the soil. Soybeans can also be grown for commercial purposes. The yellow-seeded varieties are preferred by the soybean-oil mills.

It is necessary to inoculate soybean seed, in order that nodules will develop on the roots of the plants and assimilate nitrogen from the atmosphere. The nitrogen is eventually transferred to the soybean plant when the nodules begin to decay. Seeds of alfalfa, sweetclover, hairy vetch, black medic, and other legumes should be inoculated unless the previous crop has been well inoculated.

The production of cotton is seriously affected by the boll weevil in seasons favorable for the development of these insects. One of the best methods to use in reducing the harmful effect of the boll weevil is to plant such early-maturing varieties of cotton as Early Triumph, Rowden 40, early strains of Acala, or Dixie Pine Land 11. These varieties have given superior results, compared with varieties which have been tested in the southeastern part of the State under boll-weevil conditions. Cotton responds to the use of complete fertilizers on most of the soils of this county, and a combination of an

early variety, plus fertilization, will hasten the maturity of the plants. A fair crop of cotton can be produced under average conditions before serious damage from the boll weevil can occur. An acre application ranging from 200 to 300 pounds of a 4–8–4 or 4–12–4 fertilizer applied in the row at time of planting will produce a marked increase in the yield of cotton on soils which produce less than 1,000 pounds of seed cotton an acre under average conditions. Drought is frequently the most important limiting factor in the production of cotton, and the use of fertilizer on soils which will produce from two-thirds to 1 bale of cotton without treatment may not give any increase in yield during periods when limited rainfall restricts the growth of the plants.

Peanuts make a good growth on sandy land, because these plants are comparatively low in phosphorus. This crop responds to applications of limestone if the surface soil is acid, and phosphate fertilization will materially increase the yield on many soils. The removal of peanut vines and roots is a very undesirable practice where the land is not planted to a winter cover crop, such as rye or hairy vetch. The cover crop preserves plant nutrients, which might be leached through the soil by the winter rainfall, and also protects the surface soil from erosion. Clean cultivation during the summer and the removal of all organic matter produced by a crop of peanuts is a very temporary system of farming, which eventually will exhaust the soil of organic matter and minerals needed for the growth of plants.

The production of oats in combination with Korean lespedeza, which will provide summer pasture and also maintain the nitrogen content of the soil, should be tried by more farmers. The oats may be drilled in wide rows or broadcast at the rate of 1 bushel an acre early in February, and the lespedeza may be sown about the first of March. After 2 years the soil should contain enough lespedeza seed to reseed the land each year. The oats will be sown each spring, and mineral fertilizers should be applied, in order to improve the yield of oats and increase the growth of the lespedeza.

Studies on the chemical composition of typical soil profiles indicate that the potential supply of phosphorus in many soils is very low, and that phosphate fertilization is necessary, in order to provide favorable conditions for maximum crop production. Those soils which have developed from alluvium deposited by Canadian River are fairly well supplied with phosphorus and will not respond to phosphorus fertilization at present. The data on total nitrogen, given in table 4, were determined on virgin soils and are much higher than the total nitrogen occurring in cultivated fields. Comparisons made on cropped and virgin soils collected from this county indicate that more than 50 percent of the total nitrogen has disappeared, as a result of cultivation. This information supports recommendations made in regard to the use of legume crops which are needed to maintain the nitrogen content of the soil at a level that will allow economical production of crops.

TABLE 4.—*Chemical composition of samples of important soils in Pittsburg County, Okla.*

UPLAND SOILS

Soil type and sample no.	Location	Depth	pH	Total nitrogen	Total organic matter	Total phosphorus	Readily available phosphorus [1]
		Inches		*Percent*	*Percent*	*Percent*	*Parts per million*
Leslie silty clay loam:							
1888	NW¼SE¼ sec. 10, T. 3 N., R. 15 E.	0–8	5.6	0.209	4.33	0.023	7
1889		8–28	6.1	.109	1.92	.014	0
1890		28–40	6.7	.079	1.29	.010	0
1891		40–60	5.6	.068	1.08	.015	1
Conway fine sand:							
1871	NE¼ sec. 1, T. 4 N., R. 14 E.	0–4	7.7	.053	.92	.008	10
1872		4–26	7.7	.018	.21	.004	0
1873		26–50	5.2	.026	.22	.006	0
Conway fine sandy loam:							
1892	SW¼ sec. 15, T. 4 N., R. 14 E.	0–3	5.6	.051	.30	.010	5
1892a		3–18					
1893		18–40	6.8	.046	.86	.008	5
Parsons very fine sandy loam:							
1905	SE¼ sec. 25, T. 4 N., R. 13 E.	0–3	5.7	.147	4.22	.016	4
1906		3–8	5.4	.106	2.36	.008	1
1907		8–22	5.1	.074	.53	.011	0
1908		22–40	6.0	.080	.46	.005	0
1909		40–60	6.7	.058	1.23	.009	3
Bates very fine sandy loam:							
1901	Center of sec. 8, T. 5 N., R. 15 E.	0–3	6.0	.125	2.86	.019	16
1902		3–14	6.0	.050	.79	.006	0
1903		14–24	6.7	.057	.76	.005	0
1904		24–40	8.2	.028	.25	.003	4
Durant silty clay loam:							
1884	SW¼SE¼ sec. 28, T. 4 N., R. 13 E.	0–3	6.2	.226	3.90	.035	6
1885		3–12	5.5	.150	3.07	.020	6
1886		12–24	7.5	.084	1.46	.017	20
1887		24–40	7.2	.118	.99	.014	30
Teller fine sandy loam:							
1910	NE¼ sec. 33, T. 9 N., R. 16 E.	0–6	7.3	.049	.97	.008	1
1911		6–14	7.1	.035	.30	.007	2
1912		14–40	4.9	.022	.20	.006	0
1913		40–80	5.2	.021	.39	.007	1
Parsons very fine sandy loam:							
1867	SW¼ sec. 35, T. 8 N., R. 14 E.	0–4	6.5	.110	3.18	.012	6
1868		4–12	5.9	.034	1.23	.010	4
1869		12–18	6.5	.071	1.04	.009	0
1870		18–40	7.7	.018	.32	.011	4

SOILS DEVELOPED FROM ALLUVIUM

Atkins silt loam:							
1874	SW¼SE¼ sec. 6, T. 7 N., R. 16 E.	0–6	6.4	0.123	2.11	0.023	8
1875		6–29	5.3	.069	.84	.013	0
1876		29–64	7.7	.059	.31	.020	18
Atkins silty clay loam:							
1877	NE¼ sec. 14, T. 7 N., R. 15 E.	0–4	5.7	.173	3.32	.039	6
1878		4–34	5.8	.107	1.83	.027	0
1879		34–60	6.4	.078	.90	.017	0
Verdigris silty clay loam:							
1880	Center of sec. 27, T. 8 N., R. 16 E.	0–6	7.2	.192	3.63	.025	38
1881		6–20	4.9	.099	2.10	.052	40
1882		20–40	6.3	.055	.83	.023	12
1883		40–70	6.4	.041	.47	.041	96
Pope very fine sandy loam:							
1865	SE¼ sec. 15, T. 4 N., R. 14 E.	0–5	7.7	.171	.78	.010	6
1866		5–40	6.4	.153	.77	.012	6
Yahola very fine sandy loam:							
1894	NW¼SW¼ sec. 12, T. 8 N., R. 14 E.	0–6	8.4	.102	1.71	.036	200
1895		6–24	8.4	.065	1.06	.035	300
1896		24–36	8.4	.043	.51	.021	160

[1] Samples of soil extracted with 0.2 N sulphuric acid, 1 part of soil to 10 parts of solution. When the readily available phosphorus is above 25 p. p. m., a profitable response from phosphorus fertilization will not be obtained from field crops commonly produced in this county.

A study of the acidity in the subsurface layers of the different profiles indicates that in many places plant roots may reach horizons which contain lime at different depths. Consequently, the addition of lime to neutralize the acidity of the surface soil will make it possible for plants like sweetclover to grow and remove stored nutrients from the subsoil. As a rule, the sandier soils are more thoroughly leached than soils containing a higher percentage of clay. Soils that are not subject to erosion and have a comparatively level relief usually are more acid than soils which occur on sloping land and have a comparatively shallow profile.

As a rule, sandy soils are not so well supplied with plant nutrients as soils containing a higher percentage of silt and clay. The sandy soils are more suitable for the production of row crops in this county because the surface dries quickly and the soil can be cultivated within a short period after rains, whereas the surface of soils containing a high percentage of silt and clay dries slowly and weeds and grass may be difficult to control when row crops are grown, especially on areas where a cropping system favorable for the accumulation of weed seed in the soil is used.

The greater part of the soils in this county have passed the stage where good crops can be produced by any farmer who will plow the land, use good seed, and control weeds. The economic competition from sections where virgin fertility still remains may require some change in cropping systems because of increases in the apparent cost of crop production, which will occur as a result of the use of fertilizers. There is only one general procedure, however, which can be used to develop a permanent system of soil fertility in this county. Plant nutrients must be added to the soil to compensate for those removed by crops, lost through erosion, or fixed in the soil in an insoluble form not available to plants, and the problem of land use must be given more consideration in local communities.

MORPHOLOGY AND GENESIS OF SOILS

Pittsburg County lies in southeastern Oklahoma at the western edge of the Ouachita province where this rough physiographic area merges with the prairies. A very large proportion of the Ouachita province section of the county comprises extensive bodies of rough sandstone land, where the run-off is so great as to leave but little water for plants, and consequently there has been but little soil development. At the same time soil erosion is greater than normal on the steep slopes. Below the rough lands, on the smoother hills and small sandstone areas of the lower valleys and uplands, some red and yellow soils have been developed, under a forest cover, from the beds of sandstone or interbedded strata of sandstone and shale. In the undulating or rolling valleys and prairies the soils have developed under a grass cover and are brown. They have developed from shale or shale and sandstone (interbedded) formations. A very few small areas of dark soils have developed from a few outcropping narrow beds of limestone.

The soils of this county have developed under an average annual rainfall of almost 43 inches. The range is from about 27 inches

to more than 67 inches. The rainfall has been sufficient to remove the soil materials over large areas of sandstone about as fast as the process of disintegration of the rock has taken place. This has resulted in practically no soil development in 44.8 percent of the county—the rough stony lands.

The soils developed from sandstone have been strongly leached, leaving a large proportion of sandy material in the solum and having removed much of the plant nutrients from the soil layers, thus leaving soils of low or only moderate productiveness. Small areas of soils, also highly siliceous but deeper, have developed in the northern part of the county from old alluvial deposits forming high terraces at a level with the rolling uplands. These soils have absorbed the water readily, and erosion and leaching have been less exhaustive of soil materials and of the essential plant nutrients.

The Prairie soils have developed to a great depth in many areas, but surface erosion has gullied and washed the slopes severely in places. In areas of smooth relief, soils having dense clay subsoils (claypans) have developed. These claypans are especially prevalent in smooth flat areas where drainage is deficient. Many mounds of fine sand, whose origin and development are unknown, occur on the surface of the smoother Prairie soils. The Prairie soils do not leach rapidly. The dark layer of topsoil contains only a moderate quantity of organic matter, probably because the coarse type of vegetation does not produce such a well-assimilable residue as the short grasses of the western plains. The Prairie soils are of the northern prairie type. This prairie extends northward into large unbroken tracts of rolling prairie in northeastern Oklahoma and Kansas. The Prairie soils are acid and are of only moderate productiveness, owing in part, probably, to the small quantity of valuable minerals, containing some of the essential plant nutrients, in the rocks.

Two groups of soils, the forested light-colored soils and the brown Prairie soils, represent their respective large soil provinces, but in this county, owing to small patchy exposures of rocks which produce the parent materials, together with the high rainfall, they have not assumed the well-developed characteristics of the more normal soils of the large areas elsewhere. The forested soils are mainly of two series, the Hanceville soils with red subsoils and the Conway soils with yellow subsoils. These soils are very similar in textural and structural characteristics, in relief, and in agricultural adaptations and values. Here and elsewhere in the Ouachita province large areas of these soils constitute valuable agricultural land.

In a pit near the southwest corner of sec. 15, T. 4 N., R. 14 E., a typical profile of virgin Conway fine sandy loam is exposed and shows the following layers:

A 1. 0 to 3 inches, grayish-brown structureless fine sandy loam containing a small quantity of organic matter.

A 2. 3 to 18 inches, dark-yellow slightly loamy fine sand, in which the content of clay and silt increases with depth.

B 1. 18 to 28 inches, yellow heavy but friable fine sandy clay containing lumps of reddish-brown and brownish-black ferruginous concretions.

B 2. 28 to 48 inches, yellow fine sandy clay mottled with gray and spotted with splotches of red and rusty brown.

C. 48 inches +, bluish-gray shaly sandstone.

Hanceville fine sandy loam resembles Conway fine sandy loam in physical characteristics, but it is much more red, especially in the lower horizons. In many places it has a much thinner development of the several horizons. The other soils belonging to this group are Teller fine sandy loam and Conway fine sand.

The brown Prairie soils are Parsons very fine sandy loam, Bates fine sandy loam, Bates very fine sandy loam, Durant silty clay loam, Leslie silty clay loam, and Talihina silty clay loam. The Bates and Parsons soils have developed from sandy shales or interbedded shale and sandstone. They have light-textured topsoils and well-eluviated subsoils. The subsoil of Parsons very fine sandy loam is a claypan, and the subsoils of the Bates soils are crumbly though moderately heavy.

An exposed profile of Parsons very fine sandy loam in the southeast corner of sec. 25, T. 4 N., R. 13 E., shows the following layers:

1. 0 to 6 inches, grayish-brown silt loam.
2. 6 to 14 inches, yellowish-brown friable silt loam or very fine sandy loam.
3. 14 to 22 inches, yellowish-brown structureless silty clay containing some ferruginous material.
4. 22 to 40 inches, dark yellowish-brown dense clay.
5. 40 to 60 inches, dark-gray dense clay.
6. 60 inches +, partly weathered soft argillaceous shale.

In many places the subsurface material just above the claypan is gray.

The Bates soils occupy large areas in this county. Following is a description of a profile of Bates very fine sandy loam:

1. 0 to 12 inches, grayish-brown very fine sandy loam.
2. 12 to 18 inches, yellow or yellowish-brown heavy very fine sandy loam or friable clay loam.
3. 18 to 30 inches, yellow friable crumbly clay mottled with gray.
4. 30 to 40 inches +, heavy but crumbly clay mottled gray and brown.

The clay loam soils of this group are of slight extent. Although the subsoils are of heavy clay texture, they are not claypans. Durant silty clay loam has developed from deeply weathered shale, Talihina stony silty clay loam from shale which has not weathered deeply, and Leslie silty clay loam from limestone.

Table 5 gives the results of pH determinations on several of the representative soils. These determinations were made in the laboratories of the Bureau of Chemistry and Soils, by the hydrogen-electrode method.

TABLE 5.—*pH determinations on four soil profiles from Pittsburg County, Okla.*

Soil type and sample no.	Depth	pH	Soil type and sample no.	Depth	pH
Parsons very fine sandy loam:	*Inches*		Parsons very fine sandy loam:	*Inches*	
450901	0- 4	5.8	450909	0- 3	5.4
450902	4-12	5.4	450910	3- 8	5.4
450903	12-18	6.2	450911	8-22	5.7
450904	18-40	7.6	450912	22-40	6.6
Durant silty clay loam:			450913	40-60	7.8
450905	0- 3	6.2	Bates very fine sandy loam:		
450906	3-12	5.5	450935	0- 3	5.7
450907	12-24	6.5	450936	3-14	5.6
450908	24-40	7.3	450937	14-24	6.4
			450938	24-40	8.3

SUMMARY

Pittsburg County is in southeastern Oklahoma. It comprises an area of 1,370 square miles, or 876,800 acres.

The county, which lies partly within the prairie region and partly within the Ouachita Mountain province, consists of broad valleylike prairies and rough wooded escarpments, hills, and mountainlike hilly ridges. It is drained principally into Canadian River, although much of the southern part is drained by headwaters of streams that flow southward into Red River.

The population numbers 50,778. McAlester, the county seat, has a population of about 12,000. The Missouri, Kansas & Texas; Chicago, Rock Island & Pacific; and Fort Smith & Western Railroads pass through the county. An interurban electric line connects McAlester and Hartshorne and serves the local coal-mining centers in the vicinities of these towns.

The climate is well suited for general farming. The mean annual precipitation is 42.70 inches and the mean annual temperature is 62.4° F. The average frost-free season extends over a period of 231 days.

Corn and cotton are the principal crops, supplemented by oats, sorghums, and native prairie hay. Potatoes, sweetpotatoes, truck crops, peanuts, peaches, and apples are minor crops.

The alluvial soils are generally recognized as best suited to corn, cotton, and alfalfa. The upland sandy soils are regarded as the best fruit and truck-crop soils. The Prairie soils are especially suited to oats, sorghums, native hay, and cotton. No systematic crop rotation is practiced, and the suitability of the various soils to particular crops is not generally considered.

According to the 1935 agricultural census, 55.8 percent of the land is in farms, and the average size of the individual farm is 114 acres. Nearly 24 percent of the total land in the county is available for farm crops. Nearly 70 percent of the farms are operated by tenants.

The 20 soils and land types mapped are grouped as follows: Light-colored forested upland soils, brown Prairie soils, alluvial soils, and stony and forested nonarable soils.

The county is thoroughly dissected by drainageways, and much of the arable land, especially that long in cultivation, is injuriously washed. Not only have numerous gullies been formed in the fields, but much of the topsoil has been removed from many of the sloping areas.

The light-colored forested upland soils are well suited to fruits, vegetables, and various truck crops, but only small quantities are produced for sale. These soils are used chiefly for cotton, corn, and forage crops. Yields are only moderate. The brown Prairie soils are well suited to hay, oats, cotton, corn, and forage crops, and these are grown extensively, with fair yields. The alluvial soils for the most part are well suited to corn, cotton, and in places to alfalfa and other forage crops.

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SOIL MAP
PITTSBURG COUNTY
OKLAHOMA

OKLAHOMA AGRICULTURAL EXPERIMENT STATION
C. P. BLACKWELL, DIRECTOR
AGRONOMY DEPARTMENT
N. E. WINTERS, HEAD OF DEPARTMENT

LEGEND

Atkins silt loam — As	Bates very fine sandy loam — Bf	Durant silty clay loam — Dc	Parsons very fine sandy loam — Pa	Talihina stony silty clay loam — Tc	Verdigris silty clay loam — Vc
Atkins silty clay loam — Ac	Conway fine sand — C	Hanceville fine sandy loam — Hf	Pope fine sandy loam — Pf	Talihina silty clay loam — Ts	Yahola loamy very fine sand — Ya
Bates fine sandy loam — By	Conway fine sandy loam — Cf	Leslie silty clay loam — Le	Pope very fine sandy loam — Pv	Teller fine sandy loam — Te	Yahola very fine sandy loam — Yv

Rough stony land — RsH
Hanceville soil material

Rsl.
Leslie soil material

R. 12 E. | R. 13 E. | R. 14 E. | R. 15 E. | R. 16 E. | R. 17 E. | R. 18 E.
96°00′ | 50′ | 40′ | 95°30′
T. 9 N. | T. 8 N. | T. 7 N. | T. 6 N. | T. 5 N. | T. 4 N. | T. 3 N. | T. 2 N.
35°10′ | 35°00′ | 34°50′ | 34°40′

CONVENTIONAL SIGNS

CULTURE
(Printed in black)

- City or Village, Roads, Buildings, Wharves, Jetties, Breakwater, Levee, Lighthouse, Fort.
- Secondary roads and Trails
- Railroads, Steam and Electric (DOUBLE TRACK, SINGLE TRACK, JUXTAPOSITION IN ROAD)
- Bridges, Ferry
- R.R. crossings, Tunnel (R.R. ABOVE, R.R. BELOW)
- Ford, Dam
- School or Church, Cemeteries (CEM)
- Mine or Quarry, Mine dumps, Made land
- Bluff, Escarpment, Rock outcrop and Triangulation station
- Stony and Gravelly areas
- Soil boundaries
- Boundary lines (STATE, COUNTY)
- Boundary lines (LAND GRANT, CITY OR VILLAGE)
- Boundary lines (CIVIL TOWNSHIP, RESERVATION)
- U.S. township and section lines

RELIEF
(Printed in brown or black)

- Contours, Depression contours
- Prominent Hills, Mountain Peaks
- Sand, Wash, and Sand dunes
- Shore and Low-water line, Sandbar

DRAINAGE
(Printed in blue)

- Streams
- Lakes, Ponds, Intermittent lakes
- Intermittent streams
- Springs, Canals and Ditches, Flumes
- Swamp, Salt marshes
- Submerged marsh, Tidal flats

The above signs are in current use on the soil maps. Variations from this usage appear in some maps of earlier dates.

William T. Carter, Inspector, District 4.
Soils surveyed by M. H. Layton, U. S. Department of Agriculture, in charge, and M. E. Carr and C. B. Boatright, Oklahoma Agricultural Experiment Station.

DIAGRAM OF TOWNSHIP

6	5	4	3	2	1	
7	8	9	10	11	12	
18	17	16	15	14	13	
19	20	21	22	23	24	
30	29	28	27	26	25	
31	32	33	34	35	36	

Scale 1/125000
1 ½ 0 1 2 3 4 5 Miles

Lith. A. Hoen & Co., Inc.

Field Operations
Bureau of Chemistry and Soils
1931